

## **DETAILED ACTION**

### ***Status of Claims***

1. Claims 1 – 24 are pending where claims 1, 2, 11, and 13 have been amended.

### ***Status of Previous Rejections***

2. The 35 U.S.C. 103(a) rejection of claims 1 – 24 as being unpatentable over Cetel et al. (EP 0 848 071 A1) has been maintained.

The 35 U.S.C. 103(a) rejection of claims 1, 2, 7 – 11, and 20 – 24 as being unpatentable of Darolia et al. (US 6,190,471) has been maintained.

### ***Priority***

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1, 2, 11, and 13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Line 2 of claims 1, 2, 11, and 13 recite “**2.1-4.5 wt% Mo**”. However, the original disclosure does not have *literal support*

for the claimed minimum composition of 2.1 wt% Mo and therefore this constitutes new matter.

***Claim Rejections - 35 USC § 103***

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1 – 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cetel et al. (EP 0 848 071 A1).

Cetel is applied to claims 1 – 24 as set forth in the June 2, 2009 Office action.

Claims 1, 2, 11, and 13 have been amended.

With respect to amended claims 1, 2, 11, and 13, p. 2 lines 29-36 of Cetel disclose a nickel based single crystal super alloy with 0-4.0 wt% Mo which still overlaps with the instant amended range of 2.1-4.5 wt% Mo.

Since the claimed compositional ranges of claims 1 – 24 either overlap or are within the ranges disclosed by Cetel, a *prima facie* case of obviousness exists. See MPEP 2144.05. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed Ni-based single crystal super alloy composition from the Ni-based single crystal super alloy composition disclosed by Cetel because Cetel teaches the same utility (i.e. blades in gas turbines) in the whole disclosed range.

8. Claims 1, 2, 7 – 11, and 20 – 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darolia et al. (US 6,190,471).

Darolia is applied to claims 1, 2, 7 – 11, and 20 – 24 as set forth in the June 2, 2009 Office action. Claims 1, 2, and 11 have been amended.

With respect to amended claims 1, 2, and 11, col. 2 lines 26 – 30 and col. 4 lines 18 – 32 of Darolia disclose a Ni-based single crystal super alloy with 0-2 wt% Mo. Although the composition of Mo in the Ni-based alloy of Darolia does not overlap with the amended claimed range of Mo, it is close in value. The maximum composition of 2 wt% Mo in the Ni-based alloy of Darolia is very close to the claimed minimum composition of 2.1 wt% Mo and therefore one of ordinary skill in the art would have expected the alloy of Darolia and the instant alloy to have similar properties. A prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05 I.

Since the claimed compositional ranges of claims 1, 2, 7 – 11, and 20 – 24 either overlap or are close to the ranges disclosed by Darolia, a prima facie case of obviousness exists. See MPEP 2144.05. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed Ni-based single crystal super alloy composition from the Ni-based single crystal super alloy composition disclosed by Darolia because Darolia teaches the same utility (i.e. blades in gas turbines) in the whole disclosed range.

***Response to Amendment***

9. The declaration under 37 CFR 1.132 filed December 2, 2009 is insufficient to overcome the rejection of claims 1 – 24 based upon Cetel et al. (EP 0 848 071 A1) or

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the rejection of claims 1, 2, 7 – 11, and 20 – 24 based upon Darolia et al. (US 6,190,471) as set forth in the last Office action because: the declaration merely cites a plot of the composition of Mo varied from 0-5 wt% versus the creep rate calculated using simulation software. However, the limited tick marks on the Mo wt% axis of the plot do not clearly identify the wt% to the tenth decimal point. Furthermore, it is not clear from the plot that there is a significant difference in creep rate from 2.0 wt% Mo to 2.1 wt% Mo and 2.1 wt% Mo is not even a sample tested in the cited plot. Lastly, as discussed in the above 35 U.S.C. 112 first paragraph rejection, the amended claim limitation of “**2.1-4.5 wt% Mo**” constitutes new matter because the original disclosure does not have literal support for 2.1 wt% Mo.

### ***Response to Arguments***

10. Applicant's arguments filed December 2, 2009 have been fully considered but they are not persuasive.

*Arguments are summarized as follows:*

- a. In regards to Fig. A in the response filed 12/2/2009, in the range of Larson-Miller Parameters (LMP) of 49 or more, the stress line of the present application is clearly superior to that of Cetel (the stress line of the super alloys according to the present application does not fall within the same range as Cetel). Therefore, in the creep properties range of LMP of 49 or more, the characteristics of the Ni-based single crystal super alloy according to the present application are significantly better than those of Cetel. The experimental temperature of LMP of 49 is higher than that of LMP of 41.

b. Regarding Fig. B in the response filed 12/2/2009, when the experimental temperature is 1750°F, a long time is required to form TCP phases in the alloy even though the alloy does not include Ru. In contrast, when the experimental temperature is 2000°F, TCP phases are formed in the alloy not including Ru in approximately 20 hours. In contrast, TCP phases do not form in the alloy which includes Ru after approximately 350 hours. Therefore, in the range of LMP of 49 or more, the formation of TCP phases is delayed in the alloy of the present application which includes Ru-compared to the alloy of Cetel which does not include Ru (refer to Table II of Cetel). It is assumed that the difference between the stress line of the present application and Cetel in the range of LMP of 49 or more is caused by this delay.

c. The alloy of Cetel includes a small amount of Cr compared to that found in conventional alloys. According to the concept taught in Cetel, the composite ratio of Cr should be reduced as far as possible such that the indispensable corrosion resistance of the alloy can be maintained. Also, Fig. C in the response filed 12/2/2009 demonstrates that the oxidation resistance of the alloy of Cetel is not improved when the composite ratio of Cr is 1.8 wt% or more. In addition, the composite ratio of elements such as W, Re, Mo, and the like is reduced and the high temperature creep strength of the alloy is decreased in accordance with an increase of the composite ratio of Cr. Therefore, in Cetel, the optimum range of Cr is 0.4-1.75 wt%. Also, in the laid-open application publication of Cetel (EP 0 848 071 A1), the composite ratio of Cr is 0.4-2.9 wt%. However, in the patent

publication of Cetel (EP 0 848 071 B1), the composite ratio of Cr is limited to 0.4-1.75 wt%. This clearly shows that the composite ratio of Cr in the alloy of Cetel should be minimized as much as possible. In contrast, the composite ratio of Cr in the alloy of the present application is 2.0 wt% or more which is higher than the optimum range of Cr in the alloy of Cetel.

d. In regards to the rejection based on Darolia, the composite ratio of Mo in the claimed alloy does not overlap with those of Darolia but still overlaps with those of Cetel. However, as shown in the attached Fig. D, minimum creep rate is drastically decreased when the composite ratio of Mo in the alloy is 2.1 wt% or more. In contrast, Cetel does not mention the influence of Mo to the creep properties of the alloy, and therefore, the present application is believed by applicants to be distinguishable over Cetel even though the composite ratio of Mo in the alloy still overlaps with those of Cetel.

*Examiner's responses are as follows:*

a. Fig. A of Applicant's arguments is not in the form of a declaration and therefore will be considered as part of Applicant's arguments and not as evidence in the record. See MPEP 716.01(c)II. Applicant has not demonstrated how the LMP is critical to a property of the instant invention. The LMP is not mentioned in the original disclosure and is not present in the instant claims and therefore the prior art is not required to teach this parameter. Also, Applicant has not shown the criticality of the stress load, particularly how the difference of stress loads

between the present application and the prior art, exhibits a significant difference in strength between the instant alloy and the alloy of the prior art.

b. Applicant has not submitted the information present in Reed in declaration form and therefore it will be considered as part of Applicant's arguments. See MPEP 716.01(c)II. The example in Reed cited by Applicant is not comparable to the instant claimed alloy because the alloy does not comprise Mo and comprises an amount of Co that is outside the claimed range. Therefore, it is not clear from Fig. B that the alloy of the instant invention is affected by the addition of Ru in the same way as the alloy in Fig. B. In addition, Fig. B does not teach the amount of Ru that is added to the alloy. Also, the Examiner disagrees with Applicant that Cetel does not teach the addition of Ru. The scope of Cetel is not limited to the specific embodiments it teaches. See MPEP 2123 I. The Examiner relied on the broadest teaching of Cetel on p. 2 lines 29-36 which teaches that the Ni-based single crystal super alloy may comprise 0-10.0% of one or more elements selected from a group including Ru. Furthermore, p. 3 lines 23-24 of Cetel teach that when present, Pt, Pd, Ru, and Os are effective in increasing the creep-rupture strength of the alloy. Therefore, it would have been obvious to one of ordinary skill in the art that the addition of Ru in the alloy would improve the creep-rupture strength of the alloy.

c. The Examiner has relied on EP 0 848 071 A1 published June 17, 1998 as prior art in the previous rejection, not the final published patent. Therefore, p. 2 lines 29-36 of Cetel disclose a Ni-based single crystal super alloy with 0.4-2.9

wt% Cr which overlaps with the composition of Cr recited in the instant claims.

The Examiner has relied on the broadest interpretation of Cetel because the scope of Cetel is not limited to the specific embodiments it teaches. See MPEP 2123 I. In addition, Fig. C cited by Applicant has not been submitted in declaration form and therefore will be considered as part of Applicant's arguments. See MPEP 716.01(c)II. It is not clear from the scale in Fig. C that there is a distinct change in oxidation resistance at 1.8%. Furthermore, Cetel is not required to teach the same benefits of the composition of Cr as the instant invention. See MPEP 2144 IV.

d. Although the composition of Mo in the Ni-based alloy of Darolia does not overlap with the amended claimed range of Mo, it is close in value. The maximum composition of 2 wt% Mo in the Ni-based alloy of Darolia is very close to the claimed minimum composition of 2.1 wt% Mo and therefore in the absence of evidence to the contrary, one of ordinary skill in the art would have expected the alloy of Darolia and the instant alloy to have similar properties. A *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. See MPEP 2144.05 I. In addition, it is not clear from the plot that there is a significant difference in creep rate from 2.0 wt% Mo to 2.1 wt% Mo and 2.1 wt% Mo is not even a sample tested in the cited plot.

***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CAITLIN FOGARTY whose telephone number is (571)270-3589. The examiner can normally be reached on Monday - Friday 8:00 AM - 5:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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